

## 2.1 Extent and Use of Water Resources

Our nation's water resources, which consist of both surface waters and ground water, are critical to both human activities and the functioning of ecological systems:

- Surface waters, such as rivers, lakes, ponds, reservoirs, wetlands, riparian (river and stream) areas, and estuarine areas, are fundamental components of ecological systems described in this report. They are also important sources of fresh water for human use, including drinking water, recreation, wastewater treatment, industrial usage, livestock, and irrigation. Wetlands and riparian areas help provide clean water, reduce flooding, and support critical fish and wildlife habitat.
- Ground water, one of our nation's most important natural resources, provides about 40 percent of the U.S. public water supply and much of the rural water supply, which comes primarily from domestic wells. Ground water also is the source of much of the water used for irrigation, is the principal reserve of fresh water, and represents much of our nation's potential future water supply. Ground water may contribute as much as 40 percent of all stream flow in the eastern U.S. (Alley, et al., 1999).

### Extent of Ground Water and Fresh Water Resources

Ground water comprises about 25 percent of all fresh water on Earth. By contrast, surface water and soil moisture constitute less than one percent of the world's fresh water (Alley, et al., 1999) (the remaining 75 percent is stored in polar ice and glaciers). The Great Lakes, which cover 60.2 million acres, hold about 18 percent of the globe's fresh surface water (Environment Canada and EPA, 1995).

The lower 48 states (conterminous U.S.) contain:

- About half of our nation's 41.6 million acres of lakes, ponds, and reservoirs.
- About 3.7 million miles of streams and rivers (EPA, OW, June 2000).
- An estimated 105.5 million acres of wetlands as of the mid-1990s (Dahl, 2000).

Alaska has an estimated 170 million acres of wetlands, which cover approximately 45 percent of the state. Hawaii has nearly 52,000 acres of wetlands (Dahl, 1990). U.S. coastal waters include 66,645 miles of coastline and 57.9 million acres of estuarine surface area (EPA, OW, June 2000).

Ground water and surface water are closely related and, in many areas, constitute a single resource. Both are recharged through precipitation. The U.S. receives enough annual precipitation to cover the entire country to a depth of 30 inches (known as the U.S. water budget), though the eastern U.S. receives more rainfall than the western part of the country. Over two-thirds (21 inches) of this precipitation returns to the water cycle through evapotranspiration. The rest becomes surface water, ground water, or soil moisture.

Water use is an important dynamic that can impact both the quantity and quality of available fresh water resources. Accurate information about water use helps planners and managers make informed decisions about our nation's water resources. With this information, they can project future water demand and better assess the effectiveness of alternative water-management policies, regulations, and conservation activities.

States report their water use to the U.S. Geological Survey (USGS) in five mutually exclusive categories:

- **Public water supply use**—water withdrawn by public and private water suppliers and delivered to homes and businesses for drinking, commercial, and industrial uses.
- **Self-supplied water**—water for domestic use and for livestock that is not drawn from the public supply.
- **Irrigation**—this includes application to crops, pastures, and recreational lands such as parks and golf courses.
- **Thermoelectric use**—that is, water used for cooling during electric power generation.
- **Industrial use**—this includes self-supplied water for fabrication, processing, cooling, and washing (including commercial and mining uses).

The USGS coordinates the national water-use compilation effort and publishes the results every five years in the circular series *Estimated Use of Water in the U.S.* Withdrawals are reported in billions of gallons of water per day for the five use categories. Sources of information and accuracy of water-use data vary by state and by water-use category (The Heinz Center, 2002).

The USGS (Solley, et al., 1998) estimated that:

- Total withdrawals of fresh water and saline water during 1995 were 402,000 million gallons per day (Mgal/d) for all water-use categories (public supply, domestic, commercial, irrigation, livestock, industrial, mining, and thermoelectric power).
- Total fresh water withdrawals were an estimated 341,000 Mgal/d. About 100,000 Mgal/d (29.3 percent) of this was consumed, and the rest (241,000 Mgal/d, or 70.7 percent) was returned.

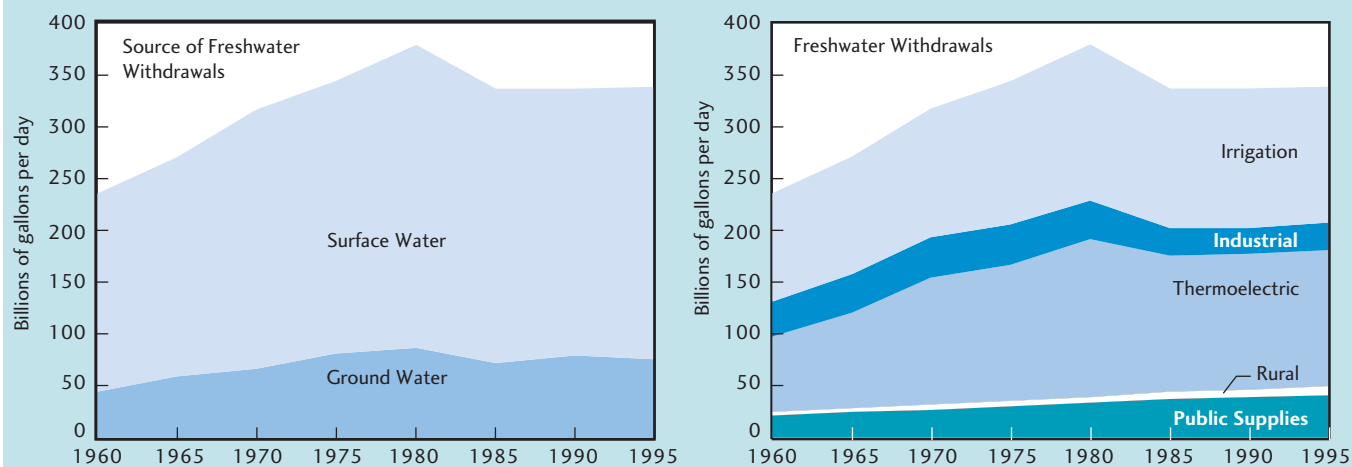
From 1960 to 1980, total water use, as well as the water use for each major use category, increased. However, from 1980 to 1995, total water use, as well as usage in several individual categories declined, though water used for public supply continued to grow (Exhibit 2-2). The two largest uses of water in the U.S.—irrigation and cooling (during electric power generation)—were responsible for much of the decline in total use between 1980 and 1995.

Decreases in withdrawals by self-supplied industrial users also contributed to the overall decline.

In many areas of the U.S., withdrawal of ground water has significantly depleted ground water reserves. Since ground water and surface water are closely related, this depletion can reduce river flows, lower lake levels, and reduce discharges to wetlands and springs. These reductions may, in turn, affect drinking water supplies, riparian areas, and critical aquatic habitats (Alley, et al., 1999). In

the southwestern U.S., for example, the High Plains aquifer covers 174,000 square miles under eight states stretching from South Dakota to Texas. By 1999, an estimated 220 million acre-feet (270 cubic kilometers, or something over half the amount of water contained in Lake Erie) had been removed (USGS, 2002), primarily for irrigation.

Exhibit 2-2: Sources of fresh water withdrawals, 1960-1995



Coverage: all 50 states

Source: Solley et al. *Estimated Use of Water in the United States in 1995*. 1998.